agriculture

Vol. 78 No. 4 April 1971

Published for the Ministry of Agriculture, Fisheries and Food
by Her Majesty's Stationery Office

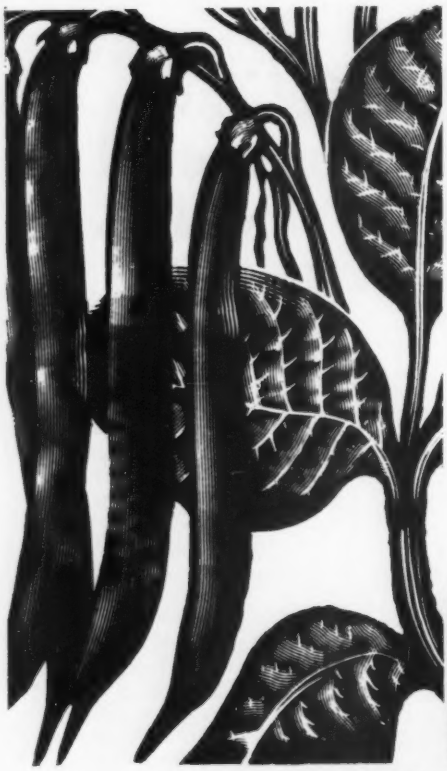
7½p
MONTHLY

Agriculture

VOLUME 78 . NUMBER 4 . APRIL 1971

Editorial Offices
Ministry of Agriculture, Fisheries and Food
Tolcarne Drive
Pinner
Middlesex HA5 2DT 01–868–7161

Contents



BENLATE*

BENOMYL FUNGICIDE

controls botrytis in beans and leaf spot in celery

BENLATE is systemic—it acts protectively and curatively to give a high degree of control against grey mould (botrytis) and anthracnose in dwarf green beans and leaf spot in celery.

Ask your distributor's representative *now* to show you how BENLATE protects your crop.

*Registered trademark of E.I. du Pont de Nemours & Co. (Inc.)

DU PONT Du Pont Company (United Kingdom) Limited, Fetter Lane, London EC4A 1HT.

Distributed by: Boots Farm Sales Limited • Farm Protection Limited Fisons Agrochemical Division • Pan Britannica Industries Limited and in Eire by Interchem Limited.

DP711b

The three piglets born by proxy last year at the Central Veterinary Laboratory, Weybridge

Our November 1970 cover showed piglets born by proxy. In the future much could depend upon research into

Egg Transfer in Pigs

A. E. Wrathall

'*Ex ovo omnia*' declared the great seventeenth century anatomist William Harvey. Nevertheless, even today, it is sometimes forgotten that mammals begin their existence as eggs, albeit very small ones. In recent years, intense research effort has been focused upon mammalian eggs so that while most of the secrets of the later stages of embryonic development remain sacrosanct the period of the egg has become a little less mysterious. For example, it is possible in some species, particularly those like the rabbit and the mouse which are frequently used in the laboratory, to remove the eggs from the body into artificial culture and there to observe under the microscope the processes of fertilization, cleavage and, even, the hatching of eggs into primitive embryos.

Naturally, during the course of these studies a great deal has also been learned of the nutrient requirements and the metabolism of eggs of these species so that now the conditions of development in the oviduct and uterus of the mother can be closely imitated. At the end of a period in culture, therefore, the eggs can often be replaced unharmed into the original or another suitable mother so that they will attach themselves to the uterus and continue their development as if nothing unusual had happened.

Early experiments

Although the study of eggs has been intensified recently, egg transfer itself is no new technique; in fact it was first carried out in rabbits over eighty

years ago. Successful egg transfers in farm animals came much later, partly because such species are relatively expensive to use for experiments, but also because it was so difficult to control the breeding cycles of egg donors and recipients and to ensure that they ovulated and reached the required stage of the oestrous (heat) cycle simultaneously. In rabbits, the latter is much less of a snag since it is the act of mating which causes the shedding of the eggs from the ovaries.

Of the three main farm mammals the pig was the last to be used for egg transfer, the first success having been recorded only twenty years ago in Russia. In spite of the late start, however, egg transfer in the pig has now become a very precise technique.

Use of methallibure

Successful transfer of eggs involves not only the development of efficient surgical methods for egg collection and re-insertion but it also requires precise synchronization of the oestrous cycles in donors and recipients. As already inferred, farm animals present difficulties in this context; in fact in the early days it was usually necessary to select many more potential egg donors and recipients than were actually needed to ensure that enough animals with synchronous heats would be available at the critical time. Mating, of course, is normally allowed only in donors. In the early 1960s, a new drug called methallibure was discovered by I.C.I. which, when fed to sows in the diet, suppressed oestrus and ovulation completely. On withdrawal of the drug from the diet, treated sows come back into heat five to seven days later. Furthermore, by giving injections of two related hormones known as gonadotrophins immediately after the end of a course of methallibure, it was found that the time of ovulation could be controlled very precisely to within a few hours. Sows treated in this way are fully fertile and survival of their embryos is equally as good as in untreated animals. By increasing the dose of the first gonadotrophin injection, donor sows can also be made to shed many more eggs than normal from their ovaries, a process known as 'superovulation'.

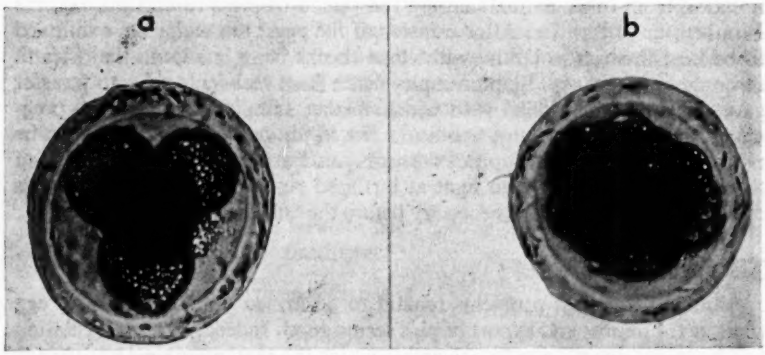
The use of methallibure has meant that egg transfers in pigs can now be planned long in advance in the knowledge that fertilized eggs will be available and recipient sows will be at the right stage to receive them. As a result, the transfer technique has been used frequently in pigs in the last few years to unravel some of the mysteries of reproduction. For example, it was by transferring very small numbers of eggs to sows that it was discovered that a minimum of four eggs is required for pregnancy to continue. In another study, eggs from a pure black breed were transferred to one side of the uterus and eggs from a white breed were put in the other. In later pregnancy, when the skin colour had had time to develop, it was found that the positions of the black and white foetuses were quite randomly distributed; a vivid demonstration of the fact that complete mixing of eggs occurs within the uterus before their positions are finally established.

Research application

In another interesting study, egg transfer was used to investigate a congenital nervous disease of pigs, the sufferers from which were known as 'spastics' (not the same as the human condition), the cause of which was

unknown. By transferring fertilized eggs from an affected spastic gilt, herself unable to sustain a pregnancy, to an unrelated gilt, it was shown that this disease did not result from any fault in the maternal environment but was in fact inherent within the egg right from conception.

Although there are many other interesting examples of how egg transfer has been applied as a research tool to solve problems of physiology and pathology in pigs, it has also been realized that the technique has a practical application as a means of exporting and importing genetically valuable livestock. So far, only a few imported breeds have been evaluated in Britain but these have shown that our own breeds have no prerogative of excellence in terms of genetic performance. Unlike the situation in sheep, where rabbits can be used to incubate eggs for several days during long distance transfer, the eggs of pigs do not survive in rabbits at all and thus the 'rabbit incubator' method for long distance travel is not possible. Pig eggs, however, do survive quite well at room temperature in tissue culture fluid and they will even develop in this sort of medium for two or three days at body temperature.



Fertilized pig eggs at (a) 3 days and (b) 4 days after service

Long range transfers

In 1970, by using high speed air travel, two successful long range pig egg transfers were made; the first was of over 900 miles from Illinois, U.S.A., to Montreal in Canada, taking ten hours; the second was of over 3,000 miles from Quebec (Canada) to Weybridge (England) which took fifteen hours. In these instances, the results were single litters containing four piglets and three piglets respectively. Although small, the important thing about these litters was that feasibility of the method was established. The eggs in both cases were transported in small bottles of sterile tissue culture fluid packed within expanded-polystyrene boxes, the total weight being under 2 kilos. Such small containers may be flown on routine passenger airlines at very low cost and, even with the expenses of surgical operations, the overall price of sending pigs in this way could be much lower than by conventional methods.

Infection prevention

At the Ministry of Agriculture's Central Veterinary Laboratory at Weybridge we have been concerned with the egg transfer method, not only

because it is considerably cheaper for import and export, but also because the risk of transmitting infectious disease is much less than with animals after weaning. After all, the fertilized egg, with a diameter of around 0·15 mm, is almost infinitely small as compared with even a newborn pig, and the chances of microbial contamination are, therefore, very low. Another advantage of this type of egg transfer is that the young born after egg transfer to foster mothers which are already adapted to the local environment have the advantage of receiving, via the colostrum, a passive immunity to many of the infectious micro-organisms in the new environment.

In spite of the low risks, transmission of certain infectious diseases, particularly some of those caused by viruses, is theoretically possible when egg transfers are carried out and for this reason quarantine cannot be entirely dispensed with when transfers are used internationally. One aim of our work at the Central Veterinary Laboratory, therefore, was to work out a system of quarantine which would ensure that any infection transmitted in or on imported eggs would be detected during the subsequent pregnancy. The following method was devised. First the donors and recipients were kept in isolation from other animals during the period of synchronization, i.e., the month prior to transfer. After transfer of the eggs, the recipients continued to be kept in strict isolation, with close checks being made on their health throughout pregnancy. Blood samples taken from recipients prior to transfer gave an 'antibody profile' with which further samples taken during pregnancy were compared; any significant rise in antibody levels could then be taken as evidence of infection of the embryos. Further evidence of disease of the embryos might come to light at birth, so rigorous clinical examination of the newborn piglets was necessary before the 'all clear' could be given.

The future

Although technical problems remain to be ironed out, the future of egg transfer for import and export of pigs seems good. Indeed, by superovulation and by improving the conditions within which the eggs are maintained during their interlude outside the sow, it should be possible not only to raise the litter size to normal after long range transfers, but also to produce more than one litter from a single crop of eggs. Closer to home, the technique also offers a solution to the problem of introduction of new blood into herds which are otherwise strictly 'closed' for health reasons. As with many other new ideas, however, although 'necessity has been the mother of invention' perfection of the egg transfer technique depends ultimately upon its use in the rigorous economic climate of the industry.

A. E. Wrathall, B.V.M.S., M.Sc., M.R.C.V.S., is a Research Officer with the Ministry's Central Veterinary Laboratory at Weybridge.

★ ★ ★ ★

How do farmers finance their enterprises? A recent survey of full time businesses in England and Wales gives an idea of the

Financial Resources of Farms

G. Sharp **A. M. Cowland**

IN 1970 the University Departments of Agricultural Economics collected, in the Farm Management Survey, balance sheets for about 550 full-time farm businesses in England and Wales which recorded the assets and liabilities at the beginning and end of their 1969/70 accounting year. In most cases the year terminated at the end of December 1969 or March 1970, giving an average of mid-February 1970. The information so collected has been analysed recently to provide answers, at least in part, to two questions often asked by and about farmers:

(*a*) From where have farmers been getting the money to finance the expansion of their production?

(*b*) How credit-worthy are farmers?

Balance sheet analysis

Let us take as an example a farmer who starts his financial year with assets in his opening balance sheet of ten cows valued at £1,000, a tractor worth £200, cash in hand of £100—in total £1,300. His liabilities are shown as debts of £300 and his own capital in the business, or net worth, as £1,000. At the end of the year his closing balance sheet shows that he now has twenty cows worth £2,000, no tractor and £300 in cash—in total his assets are now £2,300. Liabilities are now £600 in debts and £1,700 in net worth. Farm records show that during the year he charged £50 against his profits for depreciation or writing down of the tractor and that he sold it for £150.

The *gross* addition to the assets of the business is £1,200; £1,000 in cows and £200 in cash. The *net* addition is £1,000, that is the difference between the opening and closing total assets.

How has this investment been financed? £200 of the extra cows and cash came from selling the tractor for £150, and from the provision of £50 for tractor depreciation. Of the addition to net assets of £1,000, £300 (the change in liabilities) came from extra debts and £700 represents extra net worth.

When all the balance sheets were analysed on the lines of the above example they showed that in practice the main sources of extra net worth were (*a*) farm profits ploughed back into the business (after meeting tax and living expenses); (*b*) new capital introduced, and (*c*) Government grants. The

complete analysis is shown in the table.

Table

Sources and Disposition of Investment Funds in 1969/70
Average per Farm

	Tenanted farms		Owner-occupied farms		Farms with mixed tenure	
Number of farms	231		174		144	
Average acreage	203		178		208	
	£	%	£	%	£	%
Sources						
Depreciation provisions	618	30·0	571	24·6	678	32·0
Sale of assets	239	11·6	218	9·4	403	19·0
Retained farm earnings	307	14·9	603	26·0	646	30·5
Total from the farm business	1,164	56·5	1,392	60·0	1,727	81·5
New capital brought in	359	17·4	467	20·1	352	16·6
Loans (from banks, merchants, relatives, etc.)	427	20·7	252	10·9	−146	−6·9
Government grants, e.g. F.I.S.	112	5·4	209	9·0	186	8·8
Total	2,063	100·0	2,320	100·0	2,118	100·0
Disposition						
Fixed assets (incl. breeding animals)	1,541	74·7	2,009	86·6	1,945	91·8
Current physical assets (e.g., crops)	427	20·7	324	14·0	241	11·4
Liquid assets (cash, debtors, etc.)	95	4·6	−14	−0·6	−68	−3·2
Total	2,063	100·0	2,320	100·0	2,118	100·0

Note: The survey covered all types of farm (excluding horticulture) in the range 275–4,199 standard man days (approx. 1–15 men).

Interpreting the analysis

The figures in the table* demonstrate that the farm businesses examined provided the largest part of their investment funds themselves, from depreciation provisions, sale of existing assets and retained earnings. This heavy reliance on internally generated resources also applied to the main types of farm—dairy, livestock (beef cattle and sheep) and cropping—and for the main size groups measured in standard man days. The degree of self-financing may, in fact, be somewhat understated, since part of the 'new

*Published in full in *Farm Incomes in England and Wales 1969/70*. H.M.S.O., price £1·25.

capital brought in' is known to be drawn from reserves (such as Building Society deposits) which some farmers had accumulated from farm profits in previous years. The balance sheets related to the farm business only so that domestic or private assets or liabilities (like Building Society deposits) were excluded.

Why the owner-occupied and mixed tenure farms reduced their liquid or financial assets is speculative; probably because when credit is relatively scarce, interest rates high and replacement costs are rising, many farmers feel the urge to keep idle financial assets to a minimum.

Owner-occupied and mixed tenure farms mainly dependent on cropping reduced their debts substantially. After the adverse effects of the weather on arable farmers' receipts in 1968/9, incomes recovered in 1969/70 and this probably helped the arable farmers in this small sample survey to repay their debts.

The average *gross* increase in assets of the farms during the year was roughly £2,000, or around £10 per acre. This is about the same as the average net income for the labour of the farmer and his wife and return on their tenant-type physical capital on a 200-acre farm. Purchases of machinery and equipment were generally the largest single investment, making up nearly half of the gross amount of £2,000. On owner-occupied farms these items accounted, as might be expected, for rather less—some 40 per cent—and additions to land and buildings accounted for 37 per cent. The *net* addition to assets and liabilities averaged about half the gross £2,000 partly because net assets are valued exclusive of Government grants, but mainly because of writing down (or depreciation) and sale of assets during the year.

Now what about the total value of assets and 'liquidity'? Closing balance sheets in early 1970 recorded total assets of these farm businesses in very round terms as about £14,000 for the tenanted farms, £43,000 for the owner-occupied, and £35,000 for the mixed tenure. Net worth, after deducting all loans, averaged £10,000, £35,000 and £28,000 respectively. In terms of farm size, average net worth ranged from approximately £5,000 on the sixty-five small tenanted farms of some 107 acres to nearly £70,000 on the thirty-seven large owner-occupied farms of around 400 acres. The latter farms had total assets valued at around £90,000, some £64,000 of which was in land and buildings. Their long-and medium-term debts averaged £15,000, split about equally between the banks, relatives and the Agricultural Mortgage Corporation. At the other extreme the long-and medium-term debts of the sixty-five small tenants averaged only £300.

Gearing and liquidity

Two measures of credit-worthiness which influence the attitude of banks or merchants to further borrowing are the existing degree of indebtedness ('gearing' as it is sometimes called) of the farm business, and the degree of financial liquidity, that is, the extent to which current or short-term liabilities are covered by short-term assets, and especially by liquid or quickly-realizable financial assets.

High gearing increases income so long as the return on the extra capital is more than the interest charges, but if the profit rate falls below expectations high gearing becomes a burden and sharply reduces income. This particular sample of farmers, taken as a whole, do not appear in early 1970 to have been in debt or highly-geared to an uncomfortable degree. The

tenant farm businesses had sufficient assets to cover their debts about 3½ times over, and owner-occupied and mixed tenure farms about 5½ times. None of the three types of farmer—cropping, livestock or dairy—appeared noticeably more in debt than another, but all the groups of small farmers had less debts in relation to total assets than the large. At the extremes the ratio of assets to debts varied from nine for small owner-occupiers to three for large scale tenant farmers.

The small farm businesses also had in general more current and liquid assets in relation to current liabilities than the large. On average those in the 275–599 standard man days size group with around 100 acres held roughly enough liquid assets to meet all their current liabilities; the large farm-businesses with 1,200–4,199 standard man days and about 400 acres had enough to meet about half. In comparison large public companies had, in 1970, enough liquid assets to meet about forty per cent of current liabilities. (Company liquidity in 1970, however, was in general much lower than in recent previous years).

Dairy farm businesses were less liquid than the livestock or cropping farms. The regularity and reliability of the monthly milk cheque is often cited as an example of the dairy farmer's ability to economize on his holdings of liquid assets. Also, it should be remembered that the balance sheets relate to early spring; both cropping farmers and many livestock farmers can naturally be expected to have more of their working capital in cash and a smaller part in physical form at the start of the growing season compared with later in the year.

Future survey

This survey for England and Wales was developed from pioneering investigations into the balance sheets of farmers in the South-West conducted over a number of years by Mr. S. T. Morris and his colleagues of Exeter University and similar work by Mr. A. Harrison of Reading University. The Ministry is indebted to the farmers who supplied the Universities with the information.

There are about 141,000 full-time farm businesses in England and Wales and the financial characteristics of this comparatively small sample of 550 farms may well differ from those of all farms. In order to obtain a more comprehensive assessment of the capital and credit situation of agriculture in Britain the Government has appointed Professor J. S. G. Wilson of Hull University to undertake a fact-finding enquiry. This will include information obtained not only from individual farmers, land-owners and growers but also from the banks and other financial institutions.

The co-authors of this article, **G. Sharp, B.A.** and **A. M. Cowland, B.A.** are with the Ministry's Economics Division, London.

Trees planted as windbreaks at White House Farm, Newcastle

Conservation in Practice in Monmouthshire

W. R. Dixon

IN May 1970 the Development Committee of the Monmouthshire Agricultural Executive Committee met for their half-yearly meeting. Being European Conservation Year the subject was, naturally enough, conservation and papers were presented in turn by Ministry specialists as well as by farmers representing the extremes of National Park and industrial fringe farming.

Agricultural influence

The discussion was thorough and competent and one thing became abundantly clear—although those concerned primarily with agriculture were well aware of the fact that farmers might be regarded as being polluters of the environment or anti-conservationists, it was felt that any adverse effect they made on conservation was small when compared with that caused by urban activities. The Committee felt that two principles should be stated:

1. The countryside in its present condition, so scenic and beloved by urban dwellers, had been won by farmers over the years from scrub and forest, and that without cultivation it would soon revert to its former wild state.
2. The countryside had generally become a place of business for farmers, and as there were very few people who could afford to farm merely in order to keep the countryside looking beautiful it was natural for owners or proprietors of business premises to have a somewhat jealous interest in their property.

It would have been easy for the Committee at this stage to sit back and complacently pat itself on the back for having discussed the subject and to find farmers to be generally on the credit side. They had, however, other ideas. There seemed to be many situations on arable farms in the county where real thought and energy had been used to make replanning just as, if not more, attractive, than the original state. On livestock farms, too, the stepping up of the scale of enterprises caused by economics had led to real dangers of pollution and these had had to be forestalled, often at considerable expense. Accordingly, it was thought to be a good idea to try to show to the bodies in the county who made up the European Conservation Year Liaison Committee just what had been done.

The summer meeting of the Agricultural Executive Committee usually takes the form of a day outing, either to visit local commercial farms or Ministry Experimental Husbandry Farms. For 1970, however, it was decided to stay at home and play host to the Monmouthshire European Year Liaison Committee by arranging to visit two Monmouthshire farms on which farming and conservation went hand in hand.

White House Farm, Newcastle

The first visit was to White House Farm, Newcastle, by invitation of Mr. J. F. W. McConnel, himself a serving Member of the Executive, District and County Development Committees. Although now worked as a partnership with two adjoining farms, White House Farm alone was the subject of the visit. It is a holding of some 280 acres run almost entirely on arable lines. Visitors were given a map which showed the farm as it was a few years before being taken over by Mr. McConnel—at that time very much woods and parkland—compared with its present replanning for fruit farming and simplified blocks for arable cropping.

Terraced Orchards at White House Farm

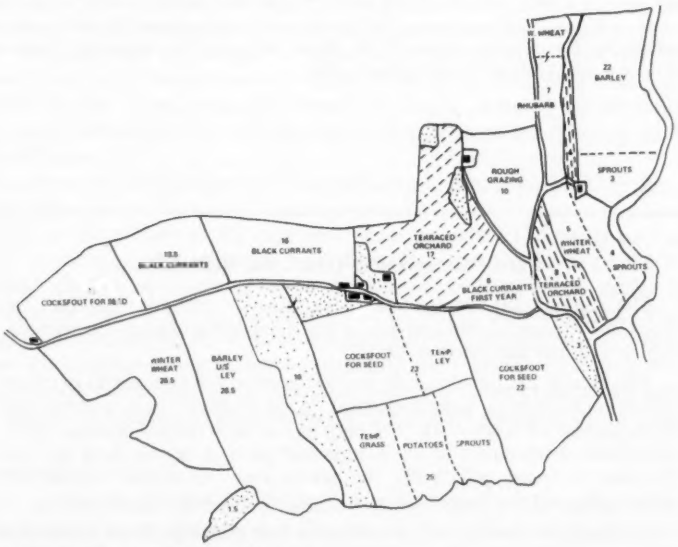
A lot of preliminary work had been done by the previous owner, eliminating trees, tree stumps left after felling some woodland, hedges and fences. About 85 acres were in arable cultivation. On taking over the farm Mr. McConnel doubled the arable acreage and provided 29 acres of terraced cider orchard and 33 of black currants; 10 acres only were left to rough

grazing and 23 to woodland, some being new plantations.

The terraced orchards had been made by driving a bulldozer along the contours of the hill at regular intervals. This gave a planting site for trees on the slope between cuts, and left a suitable track for vehicular access to the trees. The degree of slope calculated to allow for satisfactory run-off of water was 1 in 30, and the whole area remained in grass to prevent soil erosion on the steeply sloping land. The map below shows the present appearance of the farm.

Mr. McConnel explained to the visitors and fellow farmers how avenues of trees had been planted as windbreaks in exposed situations, and also how the remaining woodland was effective as a windbreak as well as providing harbourage for many wild birds. A point of particular importance to him was the prevention of soil erosion on this quite steep land, and his experience so far had demonstrated that loss did occur when land was left bare and the 'lifting' of winter frosts was followed by heavy rain.

All land not remaining in woods was now producing crops, except for the very difficult patch of rough grazing which would require considerable expense on drainage and soil works before it could be used even for terraced orchard. Black currant picking was in full swing earlier than had been anticipated and the visitors were certainly left with the impression of hectic activity even late on a hot Saturday afternoon.



White House Farm as it appears today

Home Farm, The Hendre

The second visit was to the 624-acre Home Farm, The Hendre. This was by the kind invitation of Lt. Col. Harding Rolls, whose agent, Captain E. Prior, explained the peculiar circumstances of The Home Farm. Originally it had been the home farm of a large country estate of a wealthy family, but in changed times farming had become a very necessary economic objective for the Estate.

The Home Farm itself had been built in a most delightful part of Monmouthshire, sheltered on the west, north and east by hills. The farm and the village were in this sheltered depression and had no doubt been developed there partly because there was a small stream which served to remove effluent from both farm and cottages. This had been satisfactory for the original small dairy herd when the dung and urine was soaked up by straw and taken out by hand; but the farm now had to support a much more intensive system of farming with a dairy herd of 120 Friesians paddock-grazed in summer on some 60 acres but wintered on the farmstead, their primary needs being catered for by a large silage clamp. The catchpit, which had been made originally for only about forty cows, had become inadequate to deal with the increase in the number of cattle, the large amount of slurry produced and the need to avoid pollution. Work was in progress to modify it so as to allow it to be used for liquid slurry only, semi-solid manure being diverted and taken elsewhere for spreading. Liquid from the pit would be removed before there was any danger of overspill and deposited on land where it could not seep in to a ditch. This work was essential to prevent effluent from finding its way into the nearby stream.

The two visits enabled the Liaison Committee to see at first hand some of the problems of intensification on both arable and lifestock farms, problems which were being overcome by the farmers without detriment to the environment.

This article has been contributed by **W. R. Dixon, N.D.A.,** of the Ministry's Agricultural Development and Advisory Service, Monmouth.

Farm Management Terms and Definitions

The Agricultural Departments have issued a revised version of the booklet *Terms and Definitions used in Farm and Horticultural Management*, which was first published in 1965.

The aim of the booklet is to provide common definitions to promote quick and effective communication in agricultural and horticultural management advisory work. The booklet has been revised because of the continued development of knowledge and methods in this field, and the revision is based principally on advice from university agricultural economists and the former National Agricultural Advisory Service.

Copies of the booklet may be obtained, free of charge, from Economics Division I, Ministry of Agriculture, Fisheries and Food, Room 619, Whitehall Place (West Block), London, S.W.1.

A one-man survey has produced some interesting facts and figures about

Attendances at Agricultural Shows

E. R. Butler

> '*Most machinery manufacturing firms exhibit only at the Royal and Royal Smithfield.*'[1]
> '*The one common denominator of all the principal agricultural shows in Europe is the importance of machinery displays.*'[2]

NEITHER of those statements runs true for England now that a leading manufacturer is withdrawing from the Royal. Having been to several of the two- and three-day shows I began to wonder for whom they were run. Trade stands bring in a lot of money; livestock bring in spectators (but receipts usually go out in prize money); show jumping is certainly an attraction as are other entertainments such as log cutting, parachute jumping or Wild West Rodeos.

So who goes to agricultural shows, what for and how far are they prepared to travel?

Back in the middle of the eighteenth century, when Coke was having his sheep gatherings, the intention was clear. It was to make available to interested people an opportunity to increase their knowledge. Agricultural societies developed and as the industry advanced in technology so came the concept of passing on findings of research through annual shows. From the stage where there was a gathering in nearly every small town there came a gradual rationalization. Some died away, some became more important and the shake-out continues; nevertheless, there are still plenty of shows to go to.

Scope of survey

To get some idea of the answers to the questions posed earlier, I visited several shows recently and asked questions of a number of people. Because I was the only one doing the job the number who could be questioned at any show was obviously limited. However, each day's questioning averaged one interview every three minutes, conducted at random in the show grounds. I presented myself as belonging to the show society—through the permitted use of an official badge.

This article concerns four shows spread round the country which give a typical indication of their type; a 'big' show in Eastern England, a 'County'

[1]Whitlock, Ralph. (1966). *The Agriculture Merchant, 46, 11.*
[2]Dadd, C. V. (1967). *Span, 10, 2.*

show in the South, an 'urbanized' show in the North and one 'in between' the last two types over to the West.

Not everybody likes being stopped and questioned and my 'clients' ranged between the extremes of sheer fright and rapid departure in the opposite direction and those who just wouldn't stop talking. Most refusals were quite polite and in all amounted to 7·5 per cent of those stopped. In the four areas the percentages were:

TABLE 1

	North	*East*	*South*	*West*	*Average*
Refusal %	8	5	9	8	8

These results compare with two other surveys where the rates were 2 per cent[3] and 8·6 per cent[4], although it must be added that those related to interviews undertaken only on Ministry stands. The sample size of my survey was very small and it would be wrong to imply great accuracy in the results by presenting figures correct to several decimal places. In all tables the percentages have been rounded to the nearest whole number.

Who goes to shows?

In discovering who went to the shows four categories were used; Farmer—which includes landlords, owner-occupiers and farm managers; Farm worker; Representatives—including sales representatives and others present in their business capacity but still having connections with agriculture, e.g., Directors of feed firms; and finally those with no connection at all with agriculture. The percentage of interviews in each of these four categories was:

TABLE 2

	North	*East*	*South*	*West*	*Average*
Farmer	21	46	32	34	33
Farm worker	14	10	12	11	12
Representatives	17	13	15	12	14
No connection	40	26	32	35	33
Total	92	95	91	92	92

The show in the East was the biggest and it was to be expected that the farming community would be well represented. That in the North, however, was not in an area that had a prime connection with the industry and this point is reflected by data in the table. The study referred to by Baker[4] also produced a 34 per cent return for visitors who had no connection with agriculture.

The indication is clear. The type of show like the one in the North is

[3]Sheppard, D., Smith, M, and Carrinci, S. D. (1962). *Agric. Progr., 37, 117.*
[4]Baker, J. H. S. (1966). *O. and M. Bulletin 21, 4.*

tending to draw townsfolk and must look towards presenting agriculture in a simple, direct way. To continue to attract visitors these shows must provide other entertainment such as a high class show-jumping programme and perhaps some form of 'spectacular'. Solid backing from agricultural interests cannot be relied upon. Complacency would be fatal, yet enterprise could reap great dividends.

Why go?

Having found out who goes, it is reasonable to discover why. Table 3 sets out the various interests, expressed as a percentage of the number interviewed at each show.

TABLE 3

	North	*East*	*South*	*West*	*Average*
Animals	10	25	26	15	19
Buildings and machinery	7	20	13	9	12
General interest	29	21	16	27	23
Day out	31	20	27	33	28
On duty	23	14	18	16	18

The 'Representatives' in Table 2 and those 'On duty' in Table 3 are not comparable because the latter includes stewards, judges and other officials.

The lowest percentage—20—for those going for a day out was at the show which catered more for agricultural tastes than any other. It was my impression that most of the farmers attending the shows had a purpose in being there. An interesting but not readily comparable figure emerging from a study quoted earlier was that of the farmers and farm managers attending the Kent County shows in 1955 and 1956, 11 and 17 per cent respectively, had gone for a day out.

With steadily increasing motorway lengths it could be expected that people would travel further to visit shows, but this could have contrasting effects. On the one hand, the catchment area for attracting visitors is widened; on the other, it could affect a visitor's decision to attend one show or another. How, then, did the four shows compare for attracting people from a distance? Table 4 gives an indication of this, again in percentages.

TABLE 4

Mileage travelled	*North*	*East*	*South*	*West*	*Average*
Under 20	47	39	50	70	51
21–40	31	26	31	19	27
41–60	14	18	13	3	12
Over 60	8	17	6	8	10

From the above table the inference can be drawn that the biggest show, that in the East, had the greatest drawing power. The figures also tend to support the findings of Sheppard, Smith and Carrinci[3] that farmers will travel 22 miles to a County Show.

Summing up

What can be said about 'Mr. Average' at each of the shows?

In the North, he is likely to have no connection with agriculture but a mild general interest coupled with his day out trip. He probably travelled less than 30 miles to get to the show. In the East, he is likely to be very closely engaged in agriculture and interested in most of what is going on. He will have travelled over 30 miles to attend. In the South, the chances are even whether or not he is closely involved in the industry and, though he might be an animal lover, he will probably be there for a day out. He may well not travel more than 25 miles. Our man in the West is similar to his southern counterpart, but he is more likely to be there for the beer—and will not be willing to travel very far for it.

And for the future? Let the last words belong to Ralph Whitlock. 'The successful shows are those with the right sort of people in charge.'[1]

This article has been contributed by **E. R. Butler, A.R.I.C.S., A.M.B.I.M.,** of the Ministry's A.D.A.S. staff based in London.

Report on Oilseed Rape Production

A report on oilseed rape production in England has been published by the Department of Agricultural Economics and Management of the University of Reading.

Following a study of the technical and economic information gathered from surveys of oilseed rape production in Eastern, Central and Southern England, it is concluded that the crop has a place on many cereal farms in these areas at present. Spring rape, although its profit potential is not high, can be a worthwhile break crop where alternatives are limited and where cleaning cultivations are required. On the other hand winter rape, when sown in August, has a better profit margin.

The report is based on surveys of the 1967, 1968 and 1969 crops which covered a third of the acreage of oilseed rape grown in England and Wales. It brings together the results of an investigation in the main production areas undertaken jointly by the Universities of Cambridge, Nottingham and Reading over a two year period, and co-ordinated by the Department of Agricultural Economics and Management at Reading University. It also incorporates the results of earlier work undertaken by Imperial Chemical Industries Ltd. on the 1967 crop.

This study is the third in the series of co-ordinated economic investigations commissioned by the Ministry of Agriculture, Fisheries and Food which are being undertaken by university departments of agricultural economics and published under the title 'Agricultural Enterprise Studies in England and Wales'. The views expressed and the conclusions drawn in the reports do not necessarily represent the views of the Ministry.

Oilseed Rape—A study of its production based on economic surveys of the 1967, 1968 and 1969 harvests, can be obtained from the Department of Agricultural Economics and Management, University of Reading, Building No. 4, Earley Gate, Whiteknights Road, Reading, RG6 2AR, price 50p.

This article speculates on whether the normally accepted techniques of orchard fruit production could be radically changed to a system of

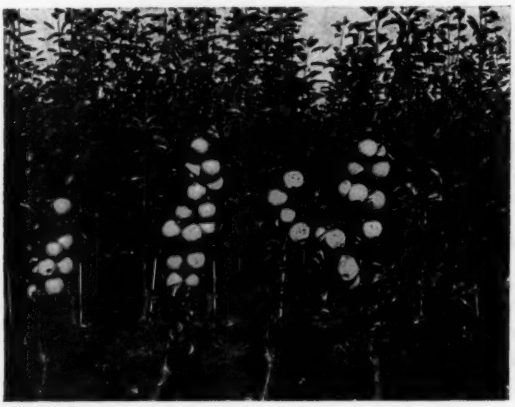
Meadow Orchards

J. P. Hudson

AN alternative title to this article might be 'Why grow Fruit on Trees?' In fact, now that fruit growing has become a highly competitive business rather than, as perhaps it once was, a way of life, trees do have several disadvantages:

1. the traditional orchard takes several years to develop before it produces a full crop;
2. the natural habit of the tree, even with careful pruning, results in fruit being produced on a variety of different structures ranging from young growing shoots to complicated spurs. This inevitably leads to unwanted variations in the uniformity of the fruits;
3. there are strong gradations of light within each tree, which result in some of the fruits being better coloured than others;
4. regulation of the tree calls for detailed hand pruning, whilst the haphazard distribution on the tree of the ripe fruits makes it difficult to devise any really satisfactory method of mechanical harvesting.

Increasingly, the economics of fruit growing call for an earlier return on capital. The market rejects fruit which does not conform to specified size and colour; before long labour scarcity is likely to compel fruit growers to find a way to mechanize all their operations. For these reasons there would be



Young Starkspur Golden Delicious trees, each bearing several pounds of fruit in the nursery on two-year old wood

many advantages if it was possible to produce fruit on much smaller, younger and simpler structures.

Simplifying the fruit tree

Normally young trees grow strongly in the first year or two and do not produce fruit buds until later. Sometimes, whilst still in the nursery, they bear fruit naturally in the second year after budding, but these fruits are usually regarded as a nuisance because they are said to reduce the size of the young tree and are often removed. However, quite heavy crops can be produced in some circumstances; for instance, a row of eighteen Cox's Orange Pippin has been known to bear an average of more than four pounds of high quality fruit per tree in the second year without any chemical treatment. It is this kind of result which makes it interesting to speculate whether heavy regular crops on two-year old shoots might provide a better basis than the traditional well-branched tree for producing apples and other fruits.

Management would be very much simplified if this were possible, because the fruit could be 'picked' by mowing off the orchard when ready, using some form of combine harvester that would separate the fruit gently and shred the shoots back on to the ground. It could be a simple operation because of the neat, compact way in which the fruit would be presented to the machine. In the following year a single shoot would be allowed to grow from each stump to repeat the process of cropping two years later, all other unwanted shoots being removed or prevented from growing by a method of chemical pruning similar to that used by chrysanthemum growers.

Productivity

Some varieties and some rootstocks are more prone than others to produce fruit buds naturally in the first year, but even where this does not happen it has been shown that the growth of strong, young shoots can be checked, more or less at will, by applying the growth retardant B.9 (N-dimethylamino succinamic acid). When applied at the right time this check leads to the prolific development of fruit buds on shoots in their first year, which can then produce a crop in the following year. Very heavy yields might be possible from this production system, because plants could be set out extremely close together, perhaps up to 50,000 per acre. Control of diseases and pests might be simplified, though no one can yet be certain of this. Furthermore it might be possible to carry out all orchard operations, apart from harvesting, by the use of chemicals applied through a multi-purpose solid-set irrigation system, fully automated so that it operates only when conditions are ideal.

In terms of productivity the introduction of an irrigation system like this could turn out to be one of the important cultural developments of this century, rivalling even the tractor in its ubiquity and usefulness in the production of high value crops like fruit. Such a system could:

(*a*) be used to insure against drought and frost;

(*b*) enable pruning to be undertaken chemically;

(*c*) give perfect control of diseases and pests without a sprayer having to pass through the orchard;

(*d*) enable almost every aspect of growth and fruiting to be controlled; ensure a completely weed-free environment; and

(*e*) greatly enhance productivity by frequent light sprinklings coupled with subtle and quick-acting control of nutrition through the leaves.

Pros and cons

What has been described above is a new method of growing fruit which could offer big advantages, including heavier and much more regular yields, with half of each orchard producing a full crop in alternate years. The major disadvantage of the system would be its heavy capital cost. Indeed, the present high price of maiden trees would make such a system prohibitive, but the proposition might become attractive if a way could be found to produce young apple trees at a fraction of their present cost, possibly from long cuttings on their own roots instead of by budding or grafting the chosen variety on to a rootstock.

However, apart from raising the plants, it must be emphasized that other aspects of the system described are also still in the exploratory stage. Though there are good reasons to suppose that it should be practicable to grow fruit in this unusual way, a number of technical problems will first need to be solved, and some of them may turn out to be difficult. For instance, much work on nutrition will be needed because the removal of most of the top part of the plant every other year will completely alter the normal balance between shoots and roots, and it is impossible to forecast at this stage what might happen after a few years of this treatment. Furthermore the keeping quality of apples grown in this way may turn out to be quite different from those grown in the traditional way, and special nutritional treatment may be needed for apples that are to be stored.

Stumps of Cox's Orange Pippin apples in a small meadow orchard, cut down twice and now in their third cycle

Pipe-dream or prophecy?

However, the system, if it worked, would certainly be a major breakthrough in fruit growing that could have profound effects on the way fruit is grown. The orchard, as we know it now, might be replaced by fields of dense, short shoots, not more than three or four feet high—hence the description 'meadow orchard'. But the high capital input needed could be

attracted to fruit growing only if the investment was rewarded by very high productivity based on heavier and much more regular yields of the precise size, colour and quality of fruit demanded by the market and so making the highest price.

The system has been under serious investigation for only three or four years. As yet no one knows how many times a tree can be cut down and yet rejuvenate shoots that can be induced to form fruit buds in the first year. Indeed, the photograph shows what are believed to be the oldest trees in the world to have had this treatment, and they are still only in their third and fourth cycles! Only time can tell whether the meadow orchard is a pipe-dream or a prophecy of the shape of things to come. From a technical point of view it would certainly be of great interest and no more improbable than year-round dwarf pot chrysanthemums would have seemed twenty years ago; such plants are now commonplace. A concerted attack by scientists of different disciplines on the problems that need to be solved might make the meadow orchard a practical proposition long before the turn of the century.

This article has been contributed by **Professor J. P. Hudson,** Director of Long Ashton Research Station, University of Bristol, from whom further details of the new system can be obtained.

Schemes for Inspection and Certification of Growing Crops 1971

The Ministry of Agriculture, Fisheries and Food is prepared to consider applications for the following schemes in 1971:

	Closing Date
Hop Plants ('A-Plus' and 'A' schemes) Strawberry Plants ('Special Stock' and 'A' schemes) Raspberry Canes ('A' scheme) Blackcurrant Bushes ('Special Stock' and 'A' schemes) Potatoes ('Special Stock', 'A' and 'H' schemes)	May 1, 1971
Mother Trees, Fruit Trees and Fruit Tree Rootstocks ('Special Stock' scheme) Fruit Tree Rootstocks ('A' scheme)	June 1, 1971
Carnations ('Foundation' and 'Special Stock' schemes)	No fixed closing date

The schemes are aimed at raising the standard of crops and enabling growers to purchase stocks of known performance and of a high standard of merit. Scientific research work and commercial experience have shown the advantage to be gained from obtaining certified stocks. The raising of stocks from certified plants ensures, as far as possible, that they will be healthy and true to type.

For further particulars and entry forms application should be made to the Ministry of Agriculture, Fisheries and Food, Plant Health Branch, Great Westminster House, Horseferry Road, London, S.W.1.

Colorado Beetle in 1970

Seventeen beetles were discovered in England and Wales during 1970, a somewhat lower figure than for the previous three years. Though comparatively few beetles were reported, it is interesting to note that the number of countries from which the beetles originated amounted to ten. Of the total of seventeen beetles, ten were associated with fruit, vegetables, etc:

1 from North America with fruit and vegetables;

1 from Canada found in frozen diced vegetables;

2 from Hungary (1 in raspberry filling in a fruit pie and 1 on the muslin sheath around a side of bacon on a lorry journeying from Hungary, via Dover, to London and Hull);

2 from Yugoslavia (1 in canned blackberries and 1 in raspberry yogurt);

2 from France (1 in lettuce and 1 in a box of narcissus bulbs);

1 from Spain with tomatoes; and

1 from Italy in a cauliflower.

Two beetles were found on ships (1 from Poland and 1 from Portugal), two were associated with car ferries (1 from Belgium and 1 from France) and one was found in the cargo bay of an aircraft from Portugal. The remaining two beetles were in cars (1 after a tour in France and the other after a tour of Europe).

No breeding colony has been found in England and Wales since 1952.

Colorado Beetle in Europe

The Reporting Service of the European and Mediterranean Plant Protection Organization (E.P.P.O.) has recently published information on the position in Europe up to 1968. Activity of Colorado beetle is most intensive in Eastern Europe where a slow and continuous spread is recorded, but there are also unexpected and sometimes large migrations, particularly in the Baltic Sea regions. Further spread has occurred in Bulgaria, Greece, the Soviet Union, Turkey and Yugoslavia. In Greece, more regions are now infested, especially in the provinces of Makedhonia, Thessalia and Ipiros. In the Soviet Union, the advance eastwards has now reached a line running approximately from the north at Riga—Velikiye Luki—Moscow and southwards to Tula—Voronezh—Rostov, including the northern coasts of the Black Sea and the Sea of Azov. In Turkey, up to 1965, the beetle was found exclusively in the 'European' part of the country where it was widespread. In 1968, it was found for the first time south-east of the Dardanelles (in the 'Asian' part) at Bayramic in the province of Canakkale.

More recent information has been issued by E.P.P.O. on the incidence of the pest in the Cotentin peninsula of France. As a result of low winter mortality and favourable weather conditions in the spring of 1970, the beetle was very numerous during the year. At the beginning of June, 60 per cent of the potato crops inspected were infested (against 24 per cent in 1969). By the end of July, this had risen to 70 per cent (50 per cent in 1969) and the severity of attack was such that complete defoliation occurred locally. Damage at this high level and the extreme density of populations have not been recorded in the past 15 years.

The watch for Colorado beetle in England and Wales is as important as ever. The Ministry is grateful to the persons who reported the presence of the beetle, and asks for the continued help of everyone to keep the pest out of the country.

H. W. Janson, *Plant Pathology Laboratory, Harpenden.*

Hedges—A New Report

Considerable controversy has been aroused in recent years by the removal of hedges and hedgerow trees in some parts of the country. A recent report by the Joint Shelter Research Committee presents a general appraisal of the situation and helps to put the controversy into perspective by assessing the traditional role of hedges and their present-day value to modern agriculture.

It is estimated that there are about 600,000 miles of hedges in Britain, some 500,000 miles of which are on agricultural land. The rate of their removal between 1946 and 1970 has been estimated at 4,500 miles a year, although there are indications that the rate has declined slightly since the 1962–66 peak period.

The report outlines the history of hedges and the regional differences in landscape pattern and hedge type, and finds that some of the traditional uses of hedges have declined in importance. Although still important in livestock areas or in very exposed districts, or as shelter for high-value horticultural crops, their value as shelter for farm crops is regarded as marginal in comparison with the increase in crop yields obtained from other husbandry practices. Similarly, the planting of hedges as windbreaks to reduce wind erosion of soil has to a large extent been superseded by other methods of control such as strip cropping, marling, claying, etc.

In spite of their decline in agricultural usefulness, hedges now provide benefits to the community as a whole, not only for their aesthetic contribution to the landscape, but also because of their historical and ecological associations. Both hedges and landscape have pronounced regional and district characteristics which it may be desirable to conserve in the national interest. The report stresses the need to evaluate the contribution of hedges to regional or local landscape patterns, and the need to know more about the regional pattern of hedge clearance.

While the contribution of hedges to the ecological balance in farming areas cannot be assessed at present, the general impression is that, on balance, their contribution is favourable, even though they may harbour some pests and diseases which affect certain agricultural and horticultural crops. Taking this and the naturalist and amenity interests into account, the report suggests that it is desirable to maintain the variety of flora and fauna associated with hedges and hedgerow trees.

The report concludes that the future of hedges in the countryside depends on the successful integration of the farming, amenity, ecological, recreational and historic interests.

The author of the report is Dr. Maurice Caborn, of the Department of Forestry and Natural Resources of Edinburgh University. Dr. Caborn is a member of the Joint Shelter Research Committee, whose terms of reference are to keep the Ministry of Agriculture, Fisheries and Food and the Department of Agriculture and Fisheries for Scotland informed of developments and trends in the field of shelter research, and to advise on the shelter projects initiated and financed by the Departments.

Copies of the report can be obtained free, from, the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex HA5 2DT.

Ploughing Grants Schemes

Ploughing Grants Schemes are now closed to new applicants. Farmers who have received approval to a programme of operations under 1968, 1969 or 1970 Schemes are reminded that the ploughing on the fields concerned must be completed by 31st May, 1971, if it is to qualify for the grant.

Standardization in Agriculture

T. I. Hammond

THE mid-1930s brought something of an agricultural revolution to the British Standards Institution. B.S.I., which had grown from a body set up by the Institution of Civil Engineers, had devoted much of its work to standardization in the engineering field. However, in 1935 there came the first of a very long series of specifications relating to dairying, which was soon joined by a wide range of agricultural standards covering machinery, produce, containers and a vast number of general specifications relating to farming hardware. In more recent years this experience has enabled B.S.I. to play a prominent role in the increasingly important international sphere.

A recent report by the Organization for Economic Co-operation and Development stated that output of fruit and vegetables had more than doubled since 1938; and that international standardization had played a considerable part in improving distribution methods, developing trade and increasing consumption. Thus it is not surprising that the Institution should be proud of its work in this international field and that so much new standardization in Britain, particularly in the testing of machinery and products, reflects agreements reached within the International Organization for Standardization (I.S.O.).

Standardization is normally concerned with ridding an industry of undesirable variety. In the case of food its function is to avoid the confusion which would ensue if goods of varying and unidentified quality, tested by different methods which might give different results, should arrive on the market *en masse*. It induces producers to consider essential trade requirements, and encourages a tendency to select high quality produce and through B.S.I. has provided producers in this country with every assistance.

Dairying

The first dairy standards were concerned with methods and apparatus for testing milk and milk products, and like all British Standards have been periodically revised to reflect every important change in techniques and requirements. The latest revisions are in close agreement with international work. Agreement has recently been reached within the I.S.O. (for which B.S.I. is the British representative) on the reference method for the determination of fat and on methods for the determination of chloride and dry matter in cheese. Perhaps the most important new development is in microbiological examination of milk and milk products.

However, behind all this wider and more recent work is a large range of vital specifications for dairying covering various types of container and

performance and quality of appliances and hardware used every day. Their existence makes it possible for producers to select suitable equipment without detailed technical knowledge.

Food products

Apart from an early series of specifications (revised in 1967) for edible oils standards for food products were originally concerned largely with containers. However, in recent years noteworthy additions have been the I.S.O. Recommendations in which B.S.I. has itself played a prominent role. Those which have been implemented as British Standards cover tests for fruit and vegetable products, meat products, cereals and pulses, analysis of oilseeds, and tests and specifications for spices and condiments. Important work on sampling of all these products is also proceeding.

Nursery stock

Work on garden produce took a very interesting turn in 1965 when B.S.I. embarked on the standardization of nursery stock. The series of standards that resulted specified such factors as origins, root systems, age and condition of trees and fruit of many types. The series also includes requirements for roses, bedding plants, bulbs, corms and tubers. This pioneering effort ran into some financial difficulty but continued support from trade associations has now been assured.

In such a series of standards variety reduction is clearly not the aim, the achievement of a high standard being of prime importance to the trade. In the case of bedding plants, for example, where the number of plants in a box and the planting dates are specified, it is recommended that plants should be sold at a time when they may be expected to thrive when immediately transplanted—a great advantage to both layman and professional.

Agricultural machinery

Standardization of machinery and equipment has future design as its main objective, with interchangeability, quality and safety as the prime considerations. Since the mid-1960s there has been a tendency to introduce test procedures as well as component standards. For example, there is a British Standard test for small petrol engines, comfort tests for seats on tractors and the important testing and safety requirements for safety cabs and frames on tractors. The tests included in the new specification for agricultural trailer brakes are of particular interest.

A standard combining the dimensional, performance and safety factors mentioned is BS 3417 *Agricultural power take-off shafts and guards*, which specifies input connections, single-extension shaft lengths and shaft yokes. The fifth part of the standard, published in 1969, on testing of guards is typical of the trend towards specifying test procedures to ensure quality and performance of machinery. It points out that the use of shaft guards in accordance with the Agriculture (Power Take-off) Regulations 1957 has prevented many serious accidents. Their effectiveness, however, depends upon their satisfactory operation, and failure due to wear or fractures may render them highly dangerous without this being apparent to the operator. The results of the test specified in this standard indicates the robustness and durability of a power take-off shaft guard.

There are instances where government legislation implements or initiates a British Standard. The alarming rate of deaths through overturning tractors caused the Ministry of Agriculture, Fisheries and Food to seek the establishment of a standard for safety frames and safety cabs upon which it could base approval. The decision was taken by Parliament in 1967 and since September 1970 every new tractor when first sold for use in agriculture has had to be fitted with an approved safety frame or cab; by 1st September 1977 all tractors will have to be so fitted.

Before these legislative steps were taken there was some complacency which made a safety frame or cab difficult to sell. Thus, since legislation became imperative, it was essential that the regulations should not only shoot but should aim straight, and the British Standard test was wisely based on proven experience from Scandinavia which showed that virtually all fatalities could be avoided in normal overturning accidents. Safety Officers in all industries have to ask themselves: 'Is the safety device safe?' British Standards relieve them of the dire responsibility of specifying in detail for every article.

However, British Standards used in legislation are rare; their adoption is, as a rule, left to the discretion of the maker and user. Of course some worthwhile standards are neglected for just this reason—for example mower knives, frog for tractor ploughs, sprayer nozzles, etc. But standards such as the three point linkage, the 540 rev/min power take-off, and the tractor test procedure have been taken up on a wide scale. A great deal of support is expected for the new trailer brakes standard already mentioned and for the specification for implement headstock for tractor/implement connection by three-point linkage or automatic coupler.

Standards for agricultural machinery are at present being metricated, and all new specifications will be in metric units. This is particularly significant because of Britain's influential role in the I.S.O. When a suitable British Standard is finalised it is placed before I.S.O. as a firm United Kingdom proposal for international standardization. International agreement often precedes a British Standard, but getting a claim in first puts the country in a strong position. Supported by the National Farmers' Union and all branches of agriculture, the B.S.I. technical committee are devoting much effort to getting the new test procedures adopted internationally. The three point linkage system detailed in BS 1841 has already been accepted.

Metrication

The subject of standardization is incomplete without a further mention of metrication. Standards for farming equipment are already being metricated, but this is a problem for the engineering industry rather than the farmer, whose main interest is in the effect of metrication on quantities and containers.

At the beginning of this article attention was drawn to the part that standardization has played in improving distribution methods; containerization and palletization are major examples. International freight container sizes were established some years ago but there is still a lot to be achieved if every advantage is to be taken of the transport, storage and marketing economies which they make possible. It is therefore of vital importance that standard ranges of package base dimensions are established in the packaging field, and metrication provides the ideal opportunity for this.

While the horticultural industry is not yet a large user of freight containers it has adopted as its most important pallet one of the internationally recommended sizes, namely that of 1,000 x 1,200 mm, which is compatible with the use of freight containers. (A special arrangement of four way entry of pallets is needed to achieve the maximum use of space within general purpose freight containers). Any British Standards for individual transport packages for horticultural produce have been, or will be, prepared with base dimensions compatible with the 1,000 x 1,200 mm pallet.

Individual package sizes also merit consideration. For example, when B.S.I. proposed punnet sizes of 125, 250 and 500 grammes to replace the present quarter, half and one pound sizes some strawberry growers reacted very strongly, rejecting the initial proposals and stating that they wanted punnet sizes of 100, 200 and 400 grammes. From a local viewpoint the arguments against the proposals, being mainly fears of financial losses on the proposed larger sizes, were understandable, but the particular divisions of a kilogramme contained in the initial proposals were made within a much wider context of international discussions. The matter is still under consideration.

Agreed recommendations

The example of the strawberry growers enables a final important point to be made about standardization. B.S.I. aims to harmonize as far as possible the wishes of all concerned. The recommendations with which the growers disagreed were contained in a form of questionnaire which had been circulated widely by B.S.I. Because of their objections, the strawberry growers were specially invited to a subsequent meeting of the B.S.I. Committee responsible for preparing the draft. They put their views forward in detail, and after detailed discussion the Committee requested B.S.I. to include in the British Standard the sizes 100, 200 and 400 grammes and to modify the other aspects of the standard accordingly. B.S.I. has not yet seen its way clear to finally adopt this decision as these sizes differ from those of 125, 250 and 500 grammes which are expected to be the new metric sizes for those dry foods for which prescribed quantities are laid down in the Weights and Measures Act 1963. Consumer interests could well look askance at the adoption of a special lower range of sizes for soft fruit.

Much has been achieved by the B.S.I. in the field of agriculture since the first specification for dairying in 1935. However, much remains to be done, and the Institution, for our mutual benefit, will proudly continue its role in achieving standardization.

The author of this article, **T. I. Hammond,** is the Consumer and General Press Officer of the British Standards Institution, London.

N.I.A.B. Fodder Crop Recommendations

The latest edition of Farmers Leaflet No. 2 *Varieties of Green Fodder Crops*, issued by the National Institute of Agricultural Botany, contains descriptive lists of cattle cabbage, rape and fodder radish and for the first time includes recommended lists of kale and silage maize.

The leaflet is obtainable from N.I.A.B., Huntingdon Road, Cambridge, price 5p, plus a stamped addressed envelope.

ALS Rent Enquiry

Farm Rents in England and Wales

THE first rent enquiry of agricultural estates by the Agricultural Land Service was carried out in October 1961. Since then, articles have appeared regularly in *Agriculture* each spring giving the main results of the enquiry of the previous October.

Full details of the 1968 and 1969 surveys, together with a summary of information from earlier enquiries, were published in Agricultural Land Service Technical Reports Nos. 19 and 19/1* *Farm Rents*, and a report covering the 1970 enquiry is in preparation. These form part of a series on land economics which includes Technical Reports published every six months on Agricultural Land Prices in England and Wales (Technical Report Nos. 20—20/3)* and Expenses of Agricultural Landownership in England and Wales (Technical Report No. 25)*.

Results of the 1970 Rent Enquiry

The A.L.S. enquiry into farm rents in England and Wales in October 1970 covered approximately 3¾ million acres of tenanted land, or rather more than a quarter of the tenanted acreage of crops, grass and rough grazing recorded in England and Wales in the 1970 June census. It related to 19,500 farms of which approximately 4,600 had had a rent change between October 1969 and October 1970. This enquiry and a parallel survey of County Council smallholdings show that the average rent per acre of crops, grass and rough grazing rose by 31p or 6·5 per cent. This increase is a little lower than the 7·1 per cent change recorded in the preceding year—an annual rate of increase which had remained very steady over the previous seven years. The average rents per acre were as shown in Table 1.

The figures hide the significant variations between counties which the map on page 169 highlights. The intensively farmed land found in Lincolnshire, Cambridgeshire, Huntingdon and also in Cheshire command the highest average rents. Land commanding higher than average rents is located mainly in East and South-East England and the Midlands, whilst in the upland areas of the North and Wales rents of under £3 an acre are common and on some hill farms are less than 50p per acre.

*Obtainable from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT.

Table 1. Average rent per acre of crops, grass and rough grazing*

	October 1969	October 1970
	£	£
England	5·20	5·54
Wales	2·54	2·69
England and Wales	4·84	5·15

*Including County Council smallholdings.

Nearly a quarter of the farms in the enquiry, about the same proportion as in previous years, had a rent change between October 1969 and October 1970. Of these, 65 per cent had had a rent change in the previous four years and only 4 per cent had had no change during the past ten years. As in earlier enquiries, there was considerable variation in the levels of new rents and in the percentage changes over the previous year's figures, depending on which of the four categories of rent change was involved. Table 2 analyses rent changes by type of rent change.

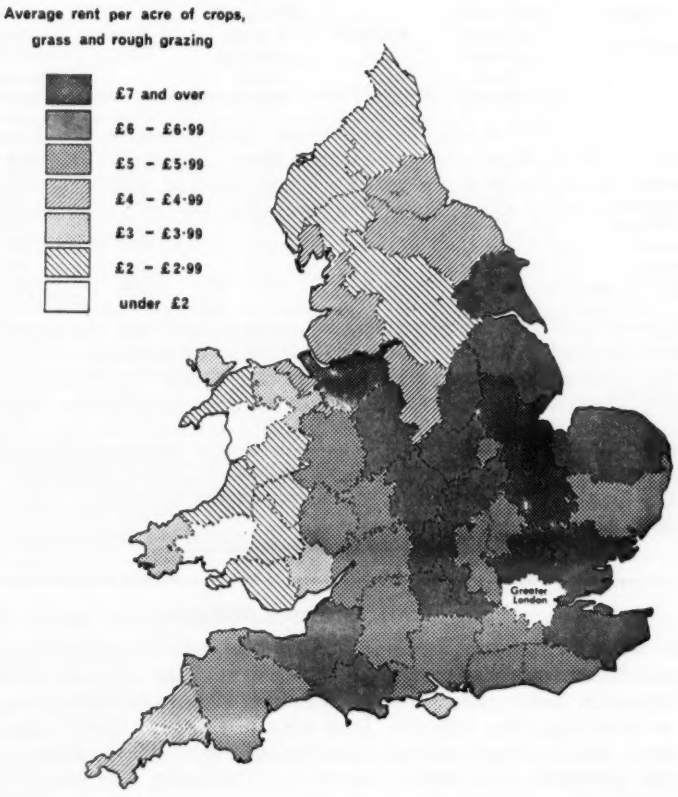
Table 2. Average rent per acre of crops, grass and rough grazing in England and Wales by type of rent change.*

	Per cent of holdings in the sample	Per cent of total acres in the sample	Rent per acre of crops, grass and rough grazing at October		Per cent change 1969 to 1970
			1969	1970	
			£	£	
New Tenancy					
by tender	0·4	0·6	3·28	5·74	+75
by agreement	2·4	2·8	4·89	6·29	+29
Sitting Tenants					
by agreement	20·5	25·3	5·10	6·12	+20
by arbitration	0·1	0·2	2·24	3·18	+42
Total with a change	23·4	28·9	5·02	6·11	+22
Total with no change	76·6	71·1	4·86	4·86	—

*Excluding County Council smallholdings.

The average increase of 22 per cent when rent changes took place during the year was slightly below the figure of 24 per cent recorded in 1969. Most rent changes were by agreement between landlords and sitting tenants and for these the increase was 20 per cent, at £1·02 per acre; this reflects various considerations, particularly returns to landlords for recent additional investment in new buildings and works. The increases for the relatively small

Average County Rent Levels, 1970.



number of farms let by tender, and of rents settled by arbitration, were much higher; because of the small numbers involved the percentage changes in rent and the levels of new rent in these two categories can show marked variation between succeeding enquiries. The average of £6·11 per acre for new rents on all farms with a rent change concealed great variation. New rents on a few small intensive holdings exceeded £30 per acre while on some large farms in parts of the North and Wales they were less than 50p per acre. Table 3 shows the average rents and average new rents by regions.

Table 3. Average rent per acre in October 1970 on all farms and on those with a rent change since October 1969, by regions

Region	All rents		New rents*		
	Average size of farm (acres of crops, grass and rough grazing)	Average rent	Average size of farm (acres of crops, grass and rough grazing)	Average rent	Percentage increase in rent over previous year for the same farms
		£		£	
Eastern	235	6·93	295	7·36	16
S. Eastern	203	6·01	241	6·54	22
E. Midland	207	6·28	229	7·07	23
W. Midland	126	6·41	158	7·14	23
S. Western	161	5·48	217	6·09	20
Northern	223	3·27	234	3·77	24
Yorks and Lancs	169	4·06	189	6·06	26
England	184	5·54	218	6·30	22
Wales	108	2·69	143	3·52	27
England and Wales	171	5·15	211	6·11	22

These are averages for regions as a whole and do not illustrate the substantial variations that can occur within regions and counties.

*Excluding County Council smallholdings.

Foul Brood Diseases of Bees

A new leaflet* published by the Ministry of Agriculture, Fisheries and Food describes the symptoms and effects of the American and European foul brood diseases of bees and advises beekeepers how to avoid spreading infection. Both these diseases are highly infectious, and it is important that beekeepers should be able to recognize the symptoms immediately they occur. The leaflet also contains lists of the counties which were free of American foul brood in 1970 and of the areas in which European foul brood was discovered in that year. These lists will be of particular interest to beekeepers who hire out bees on pollination contracts.

Beekeepers who intend to move their bees this year, or suspect that their bees may have come into contact with either disease last year (particularly European foul brood), are asked to notify the appropriate Divisional Office of the Ministry.

It will help to prevent the spread of disease if beekeepers clearly label with the owner's name and address all hives sent away; inspect all colonies for foul brood when any change of apiary location is made, e.g., for residential reasons; and confirm that their names and addresses are on record at the Divisional Office.

*Copies of the new leaflet *The Menace of Foul Brood Diseases of Bees* can be obtained, free of charge, from any of the Ministry's Divisional Offices.

Farming in Sierra Leone

T. B. Muckle

SIERRA LEONE, in West Africa, lies between latitudes 6–10°N and longitudes 10–14°W. It is a relatively small country with an area of 27,925 sq. miles, a little smaller than Scotland, and has boundaries with Guinea and Liberia. Freetown, its capital and main port, is situated on one of the best natural harbours in the world.

The climate

The country has an average ambient temperature of 26°C seldom rising above 38°C or falling below 16°C. The seasons are clearly marked between wet and dry. From June to October is the wet season with an average rainfall of 100 in. rising to 160 in. on the coast. The rest of the year is the dry season, when there is no rain but is preceded by and ends with a series of short violent thunderstorms. The relative humidity is very high, averaging 85 per cent and rising to 95 per cent during the rainy season. Occasionally, during December and January a dry wind, known as the Harmattan, blows from the Sahara, and the humidity and night temperature are considerably lowered.

Importance of agriculture

Although the main foreign exchange earning commodities are diamonds, rutile, bauxite and iron ore, 95 per cent of the population depends on agriculture for its living and there are exports of coffee, cocoa and oil palm kernels.

Of those engaged in agriculture the vast majority produce food at a level just sufficient for the needs of their own families, with little left for sale; this produces an average income of about £40–£50 per annum. The main crop is rice, the staple diet, and as the population increases demand outstrips production. Rice imports are then necessary at considerable cost of foreign exchange.

The farming system

The most common farming system is a rotation of a 10–15 years fallow followed by one or perhaps two crops, then reverting to fallow. Dense bush grows during the fallow years which has to be cut down and burnt at the beginning of the dry season. Hoes are used for digging and seed is planted in the ashes at the onset of the rains. The crop is harvested at the end of the rains and the land returns to bush. All work is done by hand and a family unit will be able to handle between 1 and 5 acres in this way. The system, which appears grossly inefficient and wasteful of land and energy, has nevertheless supported the people for thousands of years. Most of the land is

severely leached by the high rainfall, and the lateritic soil, a type of gravel, is of low fertility. The success of the farming system depends on maintaining a long interval between crops; 10–15 years was the average but the pressures of an increasing population has led, in extreme cases, to it being reduced to 5–6 years. The result is a lower yield, and to offset this the farmer cultivates a greater area so causing reduction in the period of fallow. Thus the system which has endured for so long is now in danger of collapse. Many alternative proposals have been tried, some agronomically successful but unacceptable to the farmer. He may, for example, be told to grow grass for grazing animals he does not possess when he really wishes to grow rice to eat himself.

Attempts to maintain the system by increasing yields have not produced satisfactory results. The introduction of improved varieties of rice is possible only if the necessary fertilizer and crop protection measures are also introduced. It has then been discovered that the indigenous varieties possess qualities more important than outright yield: predictable yield, albeit at a low level, under various climatic conditions; a non-shattering characteristic when stored in the head and not threshed; good milling ability due to inherent hardness. Finally, but of supreme importance, that the taste when cooked is acceptable; it is disconcerting to produce increased quantities of so-called 'improved' varieties for which there is no demand! A great difference exists between the best and the poorest of the native varieties and it might be that careful selection of these is the short term answer to the problem.

Another feature of the shifting system of cultivation is that other crops are planted at random amongst the rice. These include maize, cassava (a root crop), okra (a vegetable pod), and beniseed (an edible seed). This may be thought an unwise practice, but a farmer without means of controlling an insect attack will claim that all the crops cannot fail and cropping at low densities must surely reduce the incidence of insect and fungal attack.

Swampland cultivations

Other types of land found throughout the country include inland swamps with meandering flows of water 330–440 yd wide and 18–25 miles long where eroded silt is deposited. These are fertile areas and, if cleared and the water level controlled, can be cropped continuously and will yield well. The land is normally brushed of grass and burnt during the dry season but is too hard to cultivate by hand until the rains begin. Rice is sown in a nursery and transplanted after the onset of the rains. Many areas, however, are not cropped at all, cold water and large numbers of leeches making working conditions difficult; large-scale water control measures are too costly and those erected by hand labour are easily overtopped and washed away. Although the Sierra Leone government has recognized the importance of the swamps to increase rice production and now offers grants for cleared and levelled areas, an individual farmer is deterred from taking full advantage of this because of land tenure problems.

The bolis

Saucer shaped depressions, called bolis, are found in the northern areas of the country. These can cover up to 5,000 acres and flood up to 3ft deep in the wet season; as a consequence only grass and the occasional palm tree

and ant hill are to be found. The soil is silt washed from the surrounding higher areas; whilst not particularly fertile and too hard in the dry season for hand cultivation, it is suitable for mechanical cultivation. For the last twenty years this land has been ploughed on contract for farmers under a government subsidised scheme to bring into cultivation areas which would otherwise be idle. Communications are poor and as cultivations are seasonal there are many administrative problems to overcome to keep tractors and ploughs operating up to 100 miles from the base workshop along poor roads.

Continuous cropping produces yields of about 7 cwt of rice an acre. Severe grass weed infestation is normally removed by hand. Harvesting is also by hand; only one enterprising paramount chief uses a combine harvester—attended by a caterpillar D6 to extract it from the wetter areas.

Floating rice

In the south of the country the land is very flat and the rivers overflow in the wet season to flood the land to depths up to 15 ft. The soil is fertile due to the silt deposits and as the water table is never very far below the surface many thousands of acres are suitable for ploughing, generally by tracked vehicles. A type of rice known as 'floating rice' is grown. This can grow at a rate equal to or greater than the rise in the water level and finally flowers on a stalk 15 ft long. As the water recedes the rice slowly ripens and collapses into a tangled heap. Harvesting is by hand; it would present any combine harvester with a major problem, particularly as many of the heads lie wet under the straw. Should the rains come early or be more intense than normal, many acres are washed away before the crop becomes fully established. Water control measures could permit double cropping but the capital cost would be very great indeed. Communications are again a serious problem, a tank landing craft being necessary to transport tractors and fuel.

Despite its potential, the area is sparsely populated because of poor communications, and at harvesting time people move into the area to work, usually claiming up to one third of the crop in return.

Why a rice shortage?

It may well be asked why there should be a shortage of rice in Sierra Leone when soil and climatic conditions are so favourable. But there is little incentive to the farmer to produce more. The price frequently rises five times between the harvesting of one crop and the next and as the farmer is usually forced to sell at harvest time to repay his debts to local traders he often finds himself having to buy his rice back on credit at a price well above what he received for it in the first place. The Rice Corporation handles only a fraction of the national production as its purchasing price is often below the market price and it does not always pay cash at the time of sale.

Other farming operations

Various relief organizations aid Sierra Leone with its rice growing problems, the most notable being teams of Chinese from Tai-wan. They demonstrate complete water control and continuous cropping using irrigation. Sophisticated methods with improved short duration varieties and crop protection measures have resulted in yields of up to five times the national average. Unfortunately the Chinese techniques are so precise in terms of

transplanting, fertilizing and insect and pest control that even if the necessary materials were readily available throughout the country, many generations of experience would be necessary before the impact could be felt nationally. Furthermore, social problems make it difficult for the trainees to obtain land permanently as it is normally invested in the people and not owned by individuals.

Other aspects of crop production are worthy of comment. Drying is carried out in the sun, the effects of sun-cracking being mitigated by parboiling the rice before milling. Most milling is done by hand pounding and the government rice mills produce a low extraction rate. Large scale storage buildings are almost non-existent and loss through insect infestation has been estimated at 41 per cent of total crop. Marketing is in the hands of relatively few people, often not indigenous to the country, and not always operating in the interests of the farmer.

Exports

Export crops of coffee, cocoa and oil palm kernels are produced in localized areas but the drying and processing is poorly organized and often leads to lower quality and prices on the world market. Drying and processing equipment is seldom used and attempts to organize these on a co-operative basis have often failed due to lack of experience of operating internal combustion engines. Marketing is undertaken by the Sierra Leone Produce Marketing Board.

Future prospects

Private enterprise involvement in crop production appears to offer the best solution for the future. A few well-trained and experienced people equipped with tractors and ploughs have shown that many more acres can be brought into cultivation on a contract basis. The individual farmer can then sow, weed and harvest his crop by hand. This could develop to the stage when there would not be enough farmers to work the ploughed areas; for as education improves and becomes more widely available young people tend to join the ranks of the unemployed in the towns rather than farm the land in the present difficult conditions.

The future of the country must be based on an agricultural economy as the present mineral exports have a limited life. Incentives, possibly provided from the income at present derived from the sale of minerals, are vitally necessary to encourage increased production of home consumed crops and of the vital export crops. Then, provided he is able to obtain a fair reward for his labours, the Sierra Leone farmer could be enabled to increase his production.

T. B. Muckle was until recently Head of the Department of Agricultural Engineering at Njala University College, The University of Sierra Leone and is now on the staff of the National College of Agricultural Engineering, Silsoe, Beds.

Farm Electrical Installations

M. G. C. Kent, *A.D.A.S., Maidstone*

ELECTRICITY is considered by most people to be inherently dangerous and complicated and they leave all wiring to be carried out by competent electricians. A few, perhaps remembering their physics lessons at school, see no difficulties and willingly tackle any installation; experience has shown that many electrical accidents on farms have resulted from the work of such enthusiastic amateur electricians.

Electricity should always be considered as a potential source of danger. A special section (Section K) has been written into the Institute of Electrical Engineers Regulations for the Electrical Equipment of Buildings which specifically takes into account the adverse conditions likely to be encountered on farms and horticultural holdings; for instance presence of livestock, wet and humid atmosphere, exposure to the weather and the likelihood of mechanical damage—not to mention neglect! The regulations under the Agriculture (Safety, Health and Welfare Provisions) Act are also relevant and the following points are largely based on these two sets of Regulations.

When a farmer is deciding with an electrical engineer any new installation the main factors to be considered include:

the position of the electrical outlets;

whether they be power or lighting points;

the position and type of switch gear used to control the power and lighting circuits;

the wiring from the supply to the point of use.

These factors can have a significant effect on the safety of the installation and should be looked at individually in the light of the following comments. The mains supply connection must be carried out by the local Electricity Board.

Electrical outlets

These will be either lighting or power outlets. There are a number of points which must be considered when planning to install lighting. Lights should be placed so that they provide adequate illumination where it is required, without causing glare or excessive shade. All stationary machinery must be provided with sufficient natural and/or artificial light and here obviously the lights should illuminate the switch gear and any workplace at the machine. In damp conditions, such as in parlours and dairies, fittings must be of the damp-proof type. Bulbs should be protected from mechanical damage and must be kept away from inflammable materials. It should, for

example, be remembered that dust in a grain store can be highly inflammable.

Power outlets should, of course, be placed where they are most likely to be needed. Sufficient numbers should be fitted to avoid the use of long lengths of connecting cable to portable appliances. Such leads are, at all times, a potential source of danger. For instance, in on-floor grain stores auger sockets should be spaced along the walls of the building and not simply sited at one end. For agricultural purposes, all socket outlets must have their own switch immediately adjacent thereto and be readily accessible.

Switches

The importance of suitable switch gear is not always appreciated, but if a dangerous situation arises a readily accessible switch may mean literally the difference between life and death. The positioning of switch gear for lights will be largely determined by convenience, but switches for machinery are vitally important. Generally speaking every electric motor must have an isolator (a switch breaking all the wires) near to it; if the isolator is remote from the motor another isolator should be provided on or near the motor. Where more than one manually operated switch or stopping device controls a motor, it must not be possible to re-start the motor until every stopping device has been manually re-set. It should be remembered that all stationary machinery must be fitted with a device, readily accessible to the operator of the machine, so that it can be quickly stopped—this may mean another electrical switch. All switches should clearly show the 'off' and 'on' positions and, unless on the motor they serve, be marked to indicate which motor they control. Switches should be out of reach of livestock. In damp conditions they should be out of reach of anyone using a wash trough or in contact with any other earthed metalwork. Where a supply passes from one building to another, an isolator should be fitted inside each separate building to isolate all the wiring of that one building; in that way anyone working on the installation in that building is safeguarded.

Wiring

The choice of size and type of wiring should be left to an expert as should the actual work of installation. All wiring should be out of reach of livestock and vehicles, or suitably protected from damage by them. Cables sheathed with general purpose rubber are, in general, unsatisfactory for farm conditions being suitable only for indoor clean and dry situations. Liquid creosote will damage cables sheathed in PVC or similar plastics. Cable couplers should never be used in farm conditions, nor twisted twin or flat twin flexible cords. Adequate support is necessary for all cables; if they are to span between buildings, a catenary wire may be needed or special cable used. The minimum height for such a cable above ground level is 10 ft though in most cases it should be higher; if in a position accessible to vehicular traffic it should be at a minimum of 17ft above the ground. These minimum heights vary with the type of cable used and the voltage carried. If in doubt, the Regulations should be consulted.

Earthing

Earthing of any installation is, of course, vitally important and the Electricity Board or a competent electrician will pay particular attention to this.

Suffice it to say that the earth lead is of the greatest importance and should be protected from any damage by cattle or vehicles.

These are but a few of the many technical aspects involved in electrical installations. Remember, too, that all installations and appliances should be frequently inspected and regularly tested by a competent electrician to keep farming safe.

A Farm Safety leaflet *Electricity on the Farm* giving some 'do's' and 'don'ts' about common causes of electrical accidents may be obtained free from any of the Ministry's offices or from the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Pinner, Middlesex HA5 2DT.

★ ★ ★ ★

Ministry Publications

Since the list published in the March 1971 issue of *Agriculture* (p. 131) the following publications have been issued.

MAJOR PUBLICATION

TECHNICAL BULLETIN

No. 2. Laboratory Methods for Work with Plant and Soil Nematodes (Revised) £1·15 (by post £1·22½)
(SBN 11 240902 4)

FREE ISSUES

ADVISORY LEAFLETS

No. 163 Onion Fly (Revised)
No. 271 Potato and Tomato Blight (Revised)
No. 384 The Deep Litter System (Revised)
No. 406 Dahlias for Cut Flower Production (Revised)
No. 461 Stem Eelworm on Tulips (Revised)
No. 505 Swedes and Turnips (Revised)
No. 514 The Disinfection and Disinfestation in Poultry Houses (Revised)

SHORT TERM LEAFLETS

No. 19. Choosing Selective Weed-killers for use on Cereals in the Spring (Revised)
No. 29. Choosing Selective Weed-killers for Annual Weeds in Root Crops and Kale (Revised)

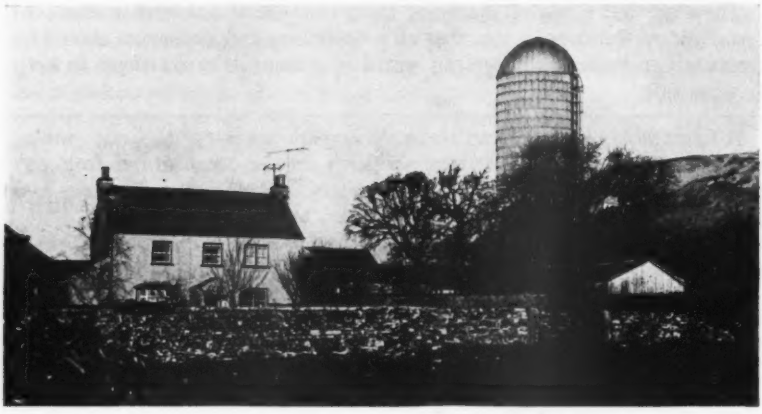
UN-NUMBERED BOOKLET

Terms and Definitions used in Farm and Horticultural Management (New)

UN-NUMBERED LEAFLET

Decimal Currency—Points for Farmers and Growers (Welsh Version) (New)

Priced publications are obtainable from Government Bookshops (addresses on p. 184) or through any bookseller. Single copies of the free items are obtainable from the Ministry of Agriculture, Fisheries and Food, (Publications), Tolcarne Drive, Pinner, Middlesex, HA5 2DT.



45. Westmorland

F. R. Emmott **S. R. Seal**

WESTMORLAND, regarded by many as nothing but a fell farming and angling county, is in reality the home of some of the country's most efficient and profitable farming. It contains not only three of the best known Friesian dairy herds but also the greatest concentration anywhere of quality stock farmers.

The county covers over half a million acres at elevations from sea level in the Kent estuary to over 3,000 feet where the high fells meet those of Cumberland. A large proportion of the land is fell and rough grazing, chiefly on the central upland range which divides the county in an east-west direction. More fertile land is found north and south of this range in the valleys of the Eden, Kent and Lune rivers, where the majority of the county's arable crops are grown. Seven thousand acres of barley, 2,000 of oats and mixed corn and 1,000 of potatoes and fodder crops are the sum total of cropping. The rest of the area comprises 200,000 acres of grass, 120,000 of rough grazing and 178,000 of fell grazings, most of the latter in the form of unenclosed 'commons'.

Agriculture apart, the county contributes much as a catchment area for Liverpool and Manchester, both corporations having reservoirs in the county as well as drawing water from some of the lakes.

Grassland and livestock

Obviously then, the county is predominantly one of livestock farming, and the grassland acreage reflects the suitability of the climate for grass growth. Rainfall ranges from 36 inches in the Eden valley to over 100 inches on the higher fells, and such high rainfall can lead to severe problems with

poaching. Grassland management and stock control have been developed to high degrees of efficiency.

In spite of the high rainfall, hay is still the main method of grassland conservation, probably because of the relatively small size of most farming units in the area. Self-feed clamps and tower silos have been used with great success on the larger units, results comparing favourably with good farms anywhere.

The 31,600 dairy cows in the county are spread over the farms of the 1,164 milk producers. The average herd size of just over twenty-seven would appear rather low but it is due to the large number of small herds kept in the Lakeland area to supply the summer tourist trade with farm-bottled milk. As elsewhere, there has been a rapid increase in herd sizes generally and 100-cow herds are now commonplace with several herds up to 150 cows. The problem of marginal farms, where expansion would be desirable to offset rising costs, remains extremely difficult in the present agricultural economic climate, with costs and lack of capital greatly inhibiting improvements.

Hill farming

The main problem on the hill farms is the very limited area of in-bye land in relation to rough grazing and fell. This creates difficulties in providing sufficient winter feed for increasing stock numbers, especially as bought-in feedingstuffs are so expensive due to high haulage charges. The backbone of these hill farms are the hill sheep, Swaledale, Rough Fell and Dalesbred predominating, with the hardy Herdwick on the Lakeland fells. Ten thousand suckler cows which attract the Hill Cow Subsidy, back up the hill sheep on these farms, helping to improve the allotment ground by removing the rougher grasses and herbage which are unacceptable to the sheep and their lambs. In common with marginal farms, the hill farms face the problem of inadequate capital to put into practise the technological innovations which could help to increase income. At the forefront of these developments is fencing, which has already been proved a valuable aid to stock management and pasture improvement, and has led to more and better lambs.

Tourist popularity

The largest non-agricultural source of income to the rural community is tourism, an 'enterprise' which has been widely and competently introduced on farms, particularly in the very popular Lake District area. Bed and breakfast accommodation, full board farm holidays, caravan and camping sites are all to be found. More recently, self-catering chalets have been developed by converting barns and other out-buildings no longer of agricultural use. Now that the area has been made more accessible to holidaymakers by the extension of the M6 motorway to Penrith, such developments will no doubt continue to cater for an increasing number of visitors drawn by the obvious attractions of the Lake District—fell walking, climbing, pony trekking and angling.

The future of the county probably lies in a blend of stock-rearing and tourism in the hills and a nucleus of intensive dairy production in the more fertile lowland areas.

in brief

- **Silage and additives**
- **In defence of hedgehogs**
- **Pig production, new style**

Silage and additives

NOTWITHSTANDING the frustrations which attend the haymaking season in the average British summer, more than 80 per cent of all our fodder conservation is in the form of hay. Silage-making, though more in accord with our weather and gaining its converts steadily, is still often a complementary rather than first choice, resulting in a poorer feeding product and a lower return in meat and milk. With the prices of bought feedingstuffs now seriously inflating the costs of farm production, the more good home-grown feed that can be provided, the healthier both the financial out-turn and the animals will be at the receiving end.

If the crop is cut at the peak of its feeding value and the silo is effectively sealed, the rest is a natural *chemical* process in which the desired fermentation encourages the beneficial bacteria at the expense of the harmful. It is logical, therefore, to suppose that control becomes easier by the use of chemical additives—like molasses and sugar which give the same acids as bacteria, mineral acids that create a very low pH, and lactic and formic acids which promote a satisfactory pH more quickly. For the most part additives are associated with 'problem' crops, where moisture and nitrogen are high and sugar low; but where, as in the normally wetter areas which preclude wilting, silage-making goes ahead without too much regard to the weather, additives are likely to be of real value—provided, of course, that the cost is reasonable.

Normally the use of an additive should not be necessary for any crop wilted above 30 per cent dry matter or with a high sugar crop wilted above 25 per cent dry matter. But where an additive is used it is important that it should be distributed uniformly throughout the crop, preferably sprayed on to the herbage as it passes through the flail chamber by an applicator mounted on the forage harvester. Unless the additive is applied uniformly, the resultant feed may not commend itself to stock and their intake inevitably drops. Future research may be expected to evaluate additives more precisely than is known for the majority of them at present, and finally perhaps a method of 'instant' silage will be evolved that will spread greater confidence in the ranks of those at present doggedly following the hay-wain.

In defence of hedgehogs

THE stricter discipline which now informs in the study of natural history has done much to correct the earlier misconceptions which formulated the knowledge concerning our wildlife and, in consequence, the attitude of man to individual species. Confronted by patient field study and laboratory investigation, superstitions have largely disappeared but persecution of certain animals whose habits are dimly perceived or plainly misunderstood still persist in some parts of the country.

The hedgehog is a case in point—an animal which has for too long been labelled 'vermin' by reason of its sins, real or imaginary. By now it is to be hoped that few, if any, dairy farmers continue to hold the belief that the hedgehog furtively visits

his herd at night to suck milk from a conveniently placed udder. Granted that hedgehogs have a partiality for milk, it would be an obliging cow in an attitude of repose that would foster so unnatural and prickly an uninvited guest! On estates where ground-nesting game birds are preserved the hedgehog is certainly *persona non grata* and, like the bounty-hunters of old who collected 3*d.* a head for every hedgehog killed, gamekeepers today still pursue it relentlessly. Admittedly, hedgehogs will take eggs and rarely the chicks of game birds, but more often than not these are probably dead or deserted before they are found. The mowing machine is a far greater hazard to nesting game than the hedgehog.

This point is made in the Forestry Commission's new and attractively illustrated leaflet*, which goes on to say that 'at best it would seem that in terms of the actual benefit derived, the gamekeepers' traditional war against the hedgehog is a rather uneconomic expenditure of time and hard work'. On the evidence for and against, hedgehogs unquestionably perform a valuable service to farmers and horticulturists. In a diet varying considerably with habitat and probably also season, few edible foods are rejected by this animal, but by analysis of stomach contents it is clear that ground beetles, earwigs, caterpillars, millepedes and earthworms make up the major part of its food. A friend, rather than a foe, the hedgehog deserves consideration instead of condemnation, and at this time of the year, when mating and nesting are going ahead, the hand of man against it should be stayed.

Pig production, new style

THE pace of progress in pig farming has been such that within the space of only a few years the whole concept has undergone a complete change. Concentration on to fewer farms has greatly increased herd sizes and now herds of 100 or more are becoming increasingly common. More and more herds are being permanently housed, calling for a degree of managerial skill and specialist stockmanship unknown under earlier systems. Added to this, and strengthening the new style of pig farming, is the steady increase in the supply of selected stock by commercial breeding companies.

Writing in the current issue of *Span*, Dr. R. F. W. Goodwin, of Cambridge University, examines this trend towards an essentially professional approach to modern pig production. He points also to the continuing involvement of major food manufacturers in the day-to-day management of their customers' farms and the injection of capital from outside the industry. 'As an agricultural industry moves more away from the land and towards the outlook of manufacturing industry', he says, 'it becomes more attractive to sectors of industry that hitherto have not been even mentally associated with agriculture.' The modern pig farmer is thus seen to be standing on the threshold of an entirely new economic complex—one which, like the poultry industry, will depend for its success on the close integration of its specialized parts. *AGRIC.*

**Hedgehogs.* Forest Record No. 77. H.M. Stationery Office. 12½p. (14p by post).

NEW VETERINARY INVESTIGATION CENTRE AT LINCOLN

A new Veterinary Investigation Centre has been opened at Lincoln. It will provide a diagnostic and consultative service for veterinary surgeons in private practice in Lincolnshire Lindsey and Kesteven and the northern parts of Nottinghamshire, who have previously had to rely on the Centre at Sutton Bonington, some 50 to 80 miles away. It will also establish an additional link with the Central Veterinary Laboratory at Weybridge on all aspects of the health of farm livestock.

The new Centre, built by the Department of the Environment at a cost of £60,000, is located at the Lindsey College of Agriculture, Riseholme, about three miles north of Lincoln, and will be manned by two professional officers supported by technical staff.

The Centre will enable the Ministry's veterinary staff to provide, through local veterinary surgeons, improved services to the farming industry in the area.

Animal Husbandry. R. D. PARK et al. Oxford University Press, 1970. £2·25.

In this, the Second Edition, the authors have revised the text to take full account of new developments since the original publication in 1961. The purpose of the book and its companion volume, *Crop Husbandry*, is to indicate the scientific basis for the practical operations involved in modern production methods.

It is intended for those newcomers to farming who are contemplating a formal agricultural education and, because of the authors' wide experience in this sphere, the information is presented in a comprehensive and easily understood form. This is not to say that the contents are confined to the elementary, for anatomy, physiology, nutrition and health are all dealt with in some depth for the student, apart from separate sections on cattle, sheep and pig husbandry.

In this latest edition, questions and exercises have been added at the end of each section which will prove a useful discipline for the reader, identifying as they do important items in the preceding text.

Unfortunately, some of the illustrations lack clarity and purpose, and the rather antiquated impression given by some of the original drawings do less than justice to the revised text.

Current examination syllabuses have been kept very much in mind during the revision of this paperback and it will no doubt prove of interest to a wider readership than that for which it was specifically written. Many of those already engaged in livestock production could gain a much deeper understanding and appreciation of the processes which they control, and benefit from the numerous practical hints which are incorporated in this very readable book.

G.M.

Farm Management and Agricultural Economics. J. B. HARDAKER, J. N. LEWIS and G. C. MCFARLANE. Angus and Robertson, 1970. £2·50.

An Australian product, this book sets out, first, to serve as an introduction to the basic principles of economics and how they relate to practical issues at farm, national and international level; second, to discuss the principles and techniques of farm management; and third, to review some major marketing and agricultural policy considerations.

The section on Economic Principles deals with the price system, demand and supply, production functions, resource allocation and cost analysis, and succeeds in covering the classical range of production economics principles with commendable clarity and brevity. The authors effectively carry the reader from the elementary to at least the middle order of refinement in each case. Whilst the concentrated presentation may not make for easy reading, it nevertheless constitutes an excellent reference text not only for students and advisers but also for practising farmers interested in the economic theories underlying the practical problems that they face.

In the section on Farm Management, there is a general discussion of the role and functions of management, followed by a chapter on farm financial analysis which somewhat cursorily deals with financial records and their analysis and lightly refers to the balance sheet. Budgeting is dealt with well, and reference is made not only to the conventional partial and complete budgeting but also to activity and parametric budgeting, and to decision trees.

The final section on Marketing and Agricultural Policy incorporates an essay on agriculture and the general economy; a short chapter on agricultural marketing, which is inevitably very general in nature; an analysis of Australia's agricultural policy; and lastly, a review of the principles and problems of international trade.

In all, this work is recommended as a worthwhile addition to the range of available text books on farm management and agricultural economics. Its treatment of production economics principles, in particular, sets a high standard, although the authors pay the penalty for attempting to cover too wide a spectrum in the space of 200 pages by failing to consistently maintain this standard throughout the rest of the book.

B.P.

Farming and Wildlife—A Study in Compromise. Edited by DEREK BARBER. The Royal Society for the Protection of Birds in Association with the Farming and Wildlife Advisory Group of Agricultural and Conservation Organizations, 1970.

This excellently produced booklet is wonderful value to anyone caring for our heritage of bird life, small mammals, flowers and plants. Well illustrated and arranged, it is a record of an unusual conference. It begins with an account of 'what its all about', an explanation by a skilled editor whose writing on any subject is always readable. Next is Sir John Winnifreth's opening address to the assembled company. He pulled no punches in making his point that farmers and conservationists are on the same side in wanting to keep the countryside something to be proud of. The remaining chapters describe an exercise carried out by 100 people of whom roughly half were agriculturists and half conservationists. In syndicates, they walked over a farm at Tring which earlier had had wildlife counts. The idea was to plan four different types of farming without taking wildlife into account. Naturalists assessed the effect of the plans and then followed a discussion to see what compromise could be reached. Generally, an all-out farming plan could be adjusted to mitigate the effect on wildlife and although some cost to the farmer was involved, it did not, even in the extreme case, seem to be totally unacceptable. In fact it was not easy to exclude from the farming syndicates' minds the need to care for wildlife. Being countrymen, they obviously cared about these things.

The naturalists added immensely to the value of the weekend conference by a moderate and unemotional account of the effect on wildlife of the various farming plans. The discussion is summarized in the booklet and throws up the main points. What is the effect of certain acts of 'improvement to a farm? How will it affect the wildlife in the area in question? There can be compromise, it may cost someone (usually the farmer) something; who should pay?

The concluding pages list the species identified, some of them rare, by the patient and hardworking naturalists whose labours began months before the event.

Although all this took place in mid-1969, it was a significant and important stage-setter for many events in European Conservation Year which derived their form and inspiration from it. The Royal Society for the Protection of Birds and its supporting Organizations deserve to be congratulated on their initiative in arranging this now famous occasion, and Derek Barber for his worthy record of it.

Copies of the booklet can be obtained from the Royal Society for the Protection of Birds (Sales), The Lodge, Sandy, Bedfordshire. Price 50p, including postage.

R.G.A.L.

books received

Capital and Finance in Agriculture. Volume 1: General Report. Organization for Economic Co-operation and Development, 1970. Copies obtainable through H.M.S.O. £1·22.

Results of Pig Management Scheme 1970. R. F. Ridgeon. Copies from the Agricultural Economics Unit, Department of Land Economy, University of Cambridge. 10p.

Desert Apples and Pears. Financial Results of the 1969 Crop. R. R. W. Folley. Copies from the School of Rural Economics and Related Studies, Wye College, Ashford, Kent. 25p, post free.

Insulated Floors for Farm Buildings. Maurice M. Barnes. Copies from the Cement and Concrete Association, Wexham Springs, Slough, Bucks., SL3 6PL. 1970. 25p.

Grass Species and Varieties. Relationships between stage of growth, yield and forage quality. J. O. Green, A. J. Corrall and R. A. Terry. Copies from The Grassland Research Institute, Hurley, Maidenhead, Berks., SL6 5LR. 1971. £1.

Dairy Farming in Transition. Structural Developments in England and Wales 1963/64—1968/69. Copies from the Milk Marketing Board, Thames Ditton, Surrey.

World Soils. E. M. Bridges. Cambridge University Press, 1971. £1·20.

F.E.O.G.A.—The Agricultural Guidance and Guarantee Fund of the E.E.C. Francois Muller. Copies from the Agricultural Adjustment Unit, University of Newcastle upon Tyne. 1970. 50p (postage 5p extra).

Agricultural Chemicals Approval Scheme

Second List of Additions to the 1971 List of Approved Products for Farmers and Growers.

NEW PRODUCTS CONTAINING APPROVED CHEMICALS

CHLORPROPHAM

For control of most annual weeds before planting, or before or at sowing, of lettuce under cold glass or in open ground.

Liquid Formulations

Herbon Pabrac No. 2—Herbon

DICHLORPROP with 2,4-D

Amine Salt Formulations

Fletcher's 2,4-DP + 2,4-D—Fletcher

MECOPROP

Potassium and Sodium Salt Formulations

BASF CMPP—BASF

Company Information

Change of Address:

E. C. Longmate Ltd., Terrington St. John, Wisbech, Cambs. PE14 7RY. Terrington St. John 491.

Thirteenth List of Additions to Supplement No. 1 of 'Chemicals for the Gardener'

BOOTS SPOT WEEDKILLER—Boots

Based on 2,4-D and mecoprop and designed for spot application to control broad-leaved weeds in lawns, rockeries, shrubberies and flower borders.

WEEDEX—Geigy

Based on simazine for control of weeds on paths and drives.

ACKNOWLEDGMENT OF PHOTOGRAPHS

We gratefully acknowledge permission to use the following photographs:

Front Cover, *Eagle Photos* (photographed by W. R. Bawden). Pp. 149 and 150, W. R. Dixon. Pp. 157 and 159, Long Ashton Research Station. P. 178, F. R. Emmott and S. R. Seal.

Printed in England for Her Majesty's Stationery Office
by Hull Printers Limited, Willerby, Hull, HU10 6DH.

(K80) SBN 11 722434 0